STRATEGY RESEARCH PROJECT

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STRATEGIC ORGANIZATIONAL CHANGE INNOVATIVE ORGANIZATIONAL AND JOB DESIGNS TO IMPROVE FUTURE PRODUCTIVITY AND OPERATIONAL EFFECTIVENESS

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STRATEGIC ORGANIZATIONAL CHANGE

Innovative Organizational and Job Designs to Improve Future Productivity and Operational Effectiveness

by

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ABSTRACT

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This strategy research paper examines the phenomenon of strategic organizational change and focuses specifically on the viability and applicability of selected new organizational designs and structures to the public and private sector. Traditional bureaucratic organizations have established nodes such as roles, departments, and basic structures and promoted specialization, including the "stovepipe" effect. These structures became serious barriers to effective internal and external coordination, communication, and hence limited organizational effectiveness. As a consequence, corporations and on the government side, DoD --e.g., the U.S. Army -- are examining new organizational designs to meet the challenges of the global environment. The paper also addresses the subjects of reinvention and reengineering, given their central role in redesigning organizational structures, processes, jobs and use of advanced technology. In summary, this paper examines the characteristics and performance criteria of innovative organizational designs aimed at helping leaders and managers adapt to the challenges of the 21st century and beyond. The major attributes include decentralization, empowerment, use of automated networks and advanced technology -- essential to achieve a more flexible, responsive and productive organization. Lastly, this paper is a subset of a larger one (300pp.) done by the author on the subject of strategic change, reinvention and reengineering, as part of the U.S. Army War College-Penn State University Cooperative Degree Program and is available in the USAWC library.

Introduction

This strategy research paper first will examine the phenomenon of strategic organizational change, and second, focus on the viability and applicability of selected new organizational designs and structures to the public and private sector. These new designs would be supported by key leadership, management, and organizational concepts, principles, and techniques.

The objective of this paper is to examine new organization concepts (i.e., innovative structures and designs) and if they could offer leaders and managers of public, private, and non-profit organizations opportunities to achieve greater performance, productivity, competitiveness, innovation; and ultimately, ensure successful mission accomplishment. Appendices A and B provide illustrations of current government and private industry reinvention and reengineering efforts.

The Environment of Global Strategic Change

Strategic change in the context of the public or private organization -- means a fundamental realignment and redesign of it major subsystems happens, i.e., structure, processes, human resource practices, and technology. These changes in turn affect the organization's strategic direction.

At its most basic level, strategic change is planned organizational change designed to alter the organization's intended courses of action to attain its goals. Strategic change could include evaluation and redefinition of the organization's goals

themselves.[1]

Strategic change is omni-present in today's world; it will be one of the few constants in the 1900s, and into the next century and beyond. Several prominent social, technological, economic and political changes are confronting modern organizations in the new global environment.

Dramatic changes include globalization (e.g., emergence of powerful trade blocs and associations like the European Union, NAFTA, and the Pacific Rim), technology advances in computing, computers, and telecommunications; a record number of business mergers, acquisitions, leveraged buy-outs, start-ups and failures; and globalization of financing and business also is occurring caused by intermingling of exchange rates, trade policies, and national politics.[2] The framework for examining new organizational structures and processes, the Socio-technical Systems model, will be analyzed next.

Socio-Technical Systems Model

The Socio-Technical Systems model increasingly is used in the organizational and managerial science disciplines to support organizational analysis, organizational plan-

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[1]Don Hellriegel, John W. Slocum, Jr., and Richard W. Woodman. 7th Ed. Organizational Behavior,(St. Paul: West Pub. Co., 1992), 711.

[2]Thomas G. Cummings and Edgar F. Huse. Organizational Development and Change, (4th ed., St. Paul: West Pub. Co., 1988). Wendell L. French and Cecil H. Bell, Jr. Organizational Development and Transformation: Managing Effective Change (Burr Ridge: Richard D. Irwin, Inc., 1994).

ning, management policy making, and organization development/organizational transformation.

A systems approach to organization thinking and functions is imperative not just due to technological advances and the new global competitive environment, but also because organizations must engage in diverse, complex, and often interrelated activities both internal and external, to their environment. Examples include operational, long-range, and strategic planning as well; consequently, the whole organization needs to be examined, not just the technical side. **Figure 1** provides an overview of the systems model in terms of explaining the various dimensions of the reinvention and reengineering processes.

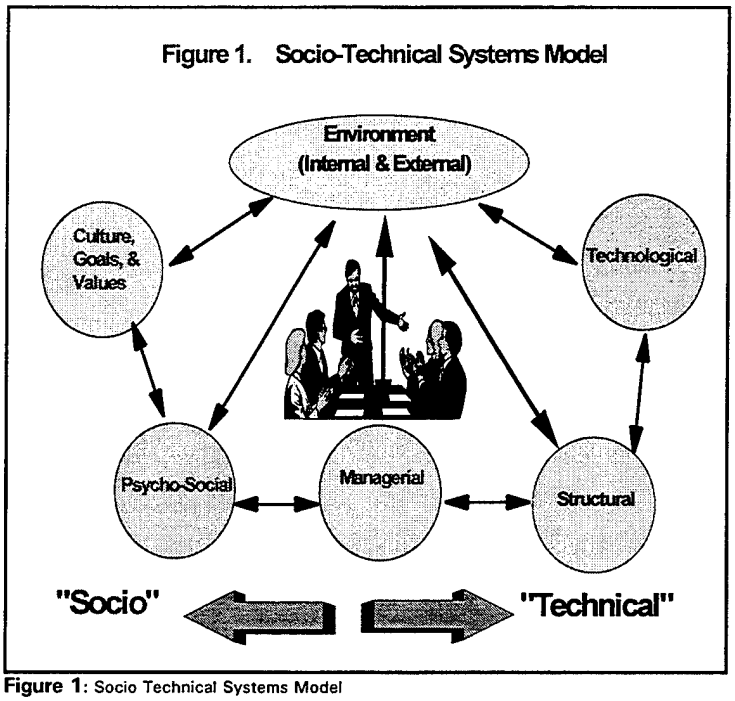


Figure 1: Socio Technical Systems Model

Socio-Technical systems thinking focuses on the organization as a integrated set of interdependent subsystems (1) goals and values, (2) technical (3) process (4) managerial and (5) structural. Of note, the structural subsystem focuses on how tasks of the organization are divid-

ed - the principle of "differentiation" and coordinated - the principle of "integration."[3]

This paper will focus on the structural subsystem of the organization, specifically, the job and organizational design portion; this examination will be preceded by a brief overview of the problems confronting modern organizations.

Problems With Current Organizational Designs

Traditional bureaucratic organizations had established nodes such as "key people, permanent roles, departments, and basic structures." These older types of mechanistic structures, by necessity, promoted "specialization" during the early part of the 20th century.[4] This practice created an unintended outcome, the "stove-pipe" effect, wherein highly differentiated, vertical structures proliferate throughout an organization. These structures eventually become serious barriers to internal and external coordination, communication, and hence, limit organizational effectiveness.

So, the conventional "strategy-structure-systems" doctrine, e.g., where vertically-driven, top-down control of information by top-level corporate executives occurs, does not function well in the new change or competitive environment.

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[3]James T. Ziegenfuss, "Are You Growing Systems Thinking Managers? Use a Systems Model to Teach and Practice Organizational Analysis and Planning, Management Policy, and Organizational Development." *Systems Practice*, (Vol. 5, no. 5, 1992), 511.

[4]Catheryn Sechler-Hudson, "Basic Concepts in the Study of Public Management" (1955), (In Shafritz & Hyde, 203-211).

These rigid structures cannot adapt to the need for diversification, which is the key to growth in new markets, products, and improved customer service.[5] The strategy and design subsystem of the modern organization will be examined next.

The Strategy and Design Subsystem

Introduction

Organizational design is the "process of diagnosing and selecting the structure and formal system of communication, division of labor, coordination, control, authority, and responsibility necessary to achieve the organization's goals.[6]

Organization, task structure, process, and various other techniques provide the manager with the means to improve coordination, productivity, and performance (e.g., strategic planning and detailed project planning).

A leader or manager must respond to structural and process problems, since these in turn can cause "dysfunctional patterns of organizational behavior." One way to do this is to re-design one or more subsystems to create "greater efficiencies and more logical combinations of functions."[7]

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[5]Hammer, Michael. "Reengineering Work: Don't Automate, Obliterate." *Harvard Business Review*. Vol. 90, no. 4, (July-August 1990), 104-112.28. Thomas J. Peters and Robert H. Waterman. In Search of Excellence: Lessons from America's Best Run Companies (New York: Harper & Row, 1982).

[6] Hellreigel, 1995:564.

[7]Peter F. Drucker, Management: Tasks, Responsibilities, Practices, (New York: Harper & Row, 1966), Steven Cohen and William Eimecke, The New Effective Public Manager: Achieving Success in a Changing Government, (San Francisco: Jossey-Bass Publishers, 1988).

The common attributes of new organizational concepts, designs, and structures will be examined next in the public and private sector. Notably, these new designs would be supported by key leadership, management, and organizational concepts, principles, methods and techniques.

This examination will be followed by two "micro" case studies to gain insights into public and private organizations that appear to be adopting innovative organizational and job designs.

New Organizational Designs or Models of the Future

Circular Model

This model is designed to maximize the three main functions of management: "identification of actual and potential problems -- i.e., threats and opportunities, (2) decision making -- determining what to do and doing it or having it done, and (3) maintenance and improvement of performance under changing and unchanging conditions."[8]

The concept of a "free-standing" management system (dynamic management of the organization's information subsystems, decision making, and its environment) is extended to the "circular" organization. It is optimized for participative planning and interaction among members at all levels and attempts to resolve the dilemma of

[8]Russell L. Ackoff Creating the Corporate Future: Plan or Be Planned for, (New York: John Wiley and Son, 1981),127.

hierarchy and democracy in traditional structures.

The circular design uses the *management board* concept, though not in the conventional corporate sense; these boards are found at all levels in an organization and are designed to allocate decision making. Each manager in this design is provided a management board. Each board (except for those at the top and bottom of the hierarchy) consists of (1) "the manager of the board it is, (2) his or her immediate superior, and (3) his or her immediate subordinates."

The basic work unit in the circular organization is small, generally no more than ten people -- implying a team character. The teams can be set up as autonomous work units and, therefore, can select and rotate their own leadership.

Finally, each of the "boards" perform four distinct functions: (1) coordinating the activities of units represented on it, with the activities of two levels above and two below (2) integrating activities in the same manner, (3) policy making - rules that "govern decision making," and (4) evaluation and approval of the performance of the manager reporting to it. This is similar to the new trend in personal performance measurement called "peer review" or the more controversial "360 degree" feedback, wherein a "circular" evaluation process links superiors, subordinates, peers and individuals.

The circular organization then, is one innovative organizational approach that provides for a balance between "democracy" and "control" and attempts to increase the capability for "learning and adaptation in organizations, their work units, and their individual members" (Ackoff, 1981:128).

Network Model

This type of organizational concept is an alternative to the large, vertically integrated organizational structures of the first three quarters of the 20th century. The network design aims at facilitating the management of highly diverse, complex, and dynamic factors involving multiple units and many people, both within and external to the organization[9]. The network design is brought on by globalization and technological changes and is based on the notion that organizations are conceived as "clusters" of people joined by a variety of links.[10]

On the business side, network designs are gaining popularity as leaders and managers of mid- to large corporations search for more innovative ways to compete for new markets and allocate their resources on a global basis.

Three types of network models are designed to meet these competitive challenges. The first is "internal," which captures entrepreneurial and market benefits without having to outsource (contract out to other companies). The basic logic of internal networks is they must adhere to market process and therefore (at least theoretically) will strive for innovation and improved performance.

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[9] Don Hellriege, John W. Slocum, Jr., and Richard W. Woodman. 7th Ed. Organizational Behavior), (St. Paul: West Pub. Co., 1992) 596.

[10]Noel Tichy, Managing Strategic Change: Technical, Political, and Cultural Dynamics, (New York: John Wiley, c1983),70 and Charles C. Snow, et al. "Managing 21st Century Network Organizations," in Kolb, The Organizational Behavior Reader, 611-624.

The next type is the stable network, which typically employs partial outsourcing as a means of infusing flexibility into the overall "value chain." Here, assets are owned by several firms with a set of vendors "nestled" around a large "core" firm.

The last type of network model is (3) dynamic network - the most "drastic" form which recognizes the fast-paced, discontinuous, competitive nature of the business environment. It preserves specialization but uses extensive outsourcing to achieve diversity, flexibility, and responsiveness.

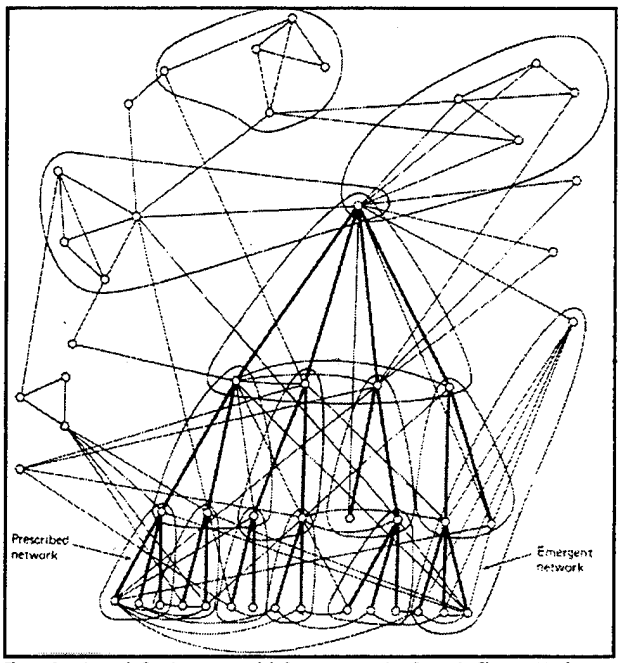


Figure 2 Network Contingency Model. Source: Managing Strategic Change, Noel M. Tichy, (New York: Wiley, c1983), p.71

Each network node practices its particular expertise and there is maximum exploitation of available technology and brokers are used to package resources quickly across nodes.

Figure 2 depicts the Network [Contingency] Model and also is helpful in explaining the dynamic, interconnected nature all the models analyzed in this paper.

In terms of operation, the network clusters transmit (1) goods and services e.g., raw materials, marketing research support, and financial and accounting services among groups within a company; (2) information - exchange of ideas and knowledge among people; (3) influence - giving orders and direction both formally and informally; and affect - exchanges of friendship among individuals and groups (i.e., behaviors,

values, attitudes, beliefs, and culture).

Of note, the clusters of people are both formally structured (*prescribed*) such as departments and groups and informally structured (*emergent*) such as coalitions and cliques. This allows for both stability and dynamism in the organization -- a seeming contradiction -- but achievable through a "multitude of interpersonal work arrangements."

In sum, the network design model emphasizes the twin features of formal and informal organizational design and structure: the formal side mirrors the classical/mechanistic bureaucratic model except for the additional links individuals have with the environment; the informal side is the medium for organizational transactions (i.e., affect, influence, information).

The Polynoetic Organization with Fractal Design

This new form of organization first is described by the term: "polynoetic," meaning many centers of knowledge[11]. It is a knowledge and learning organization in which integration occurs among the various knowledge centers through the use of centralized resource groups (i.e., "integrating core"). Conceptually, the configuration resembles several overlapping circles with a "core." The integrating core itself is made up of individuals who themselves are "representatives" of the various knowledge centers in

[11]William A. Pasmore, Creating Strategic Change: Designing the Flexible, High-Performing-Organization, (New York: John Wiley & Sons, Inc., 1994), 166.

the organization.

Teams in the polynoetic organization are designated as "learning projects, which provide an opportunity for members to "enhance their understanding either of their area of expertise, or of the organization, its customers, or its environment." Finally, success of the polynoetic organization depends on each team developing "holographic" knowledge of the work process, designs, communications paths, etc.

The holograph knowledge metaphor is used to illustrate how the total organization would look when viewed from any angle -- a common pattern could be seen at all levels, since all people would know not just their own job but also a little about each of the other elements in the organization, and the external customers as well.

The "fractal" design complements the polynoetic organizational form and also uses an analogy -- that of a fractal, the basic building block of highly complex and chaotic-appearing systems. But these computer-generated images in reality have basic repetitive patterns and hence, are "chaos in order."

The fractal design in the polynoetic organization similarly is likened to the patterns of a quilt, with the smallest ones being individuals in the organization -- fractals. The various fractals, in different sizes and shapes, comprise different types of business, technical, and social skills; the pattern of shared skills and beliefs (i.e., culture) emerge when the organization is viewed -- again, as a whole.

Finally, knowledge and skills intersect as needed to solve problems and perform the organization's tasks. The bottom line is that the fractal design provides the mobility, flexibility, and diversity for the organization to simultaneously apply different types of

people, knowledge, or abilities -- which vary from unit to unit -- to meet needs (i.e., through "local responsiveness") while preserving the integrity of the overall organizational pattern.

The fractal design is based on the "fast-cycle, short-product life span method. It is an extension of the increasingly popular Socio-Technical Systems method known as "fast-cycle, full-participation" change. This is essentially a process that uses techniques such as "search conferences" and teams to develop strategies for addressing strategic change in organizations.[12]

Finally, the fractal organization design looks at optimizing "holographic" knowledge (i.e., cutting across the organization's functional boundaries), multi-skilling at same time preserving organizational integrity.

Virtual Model

The concept of "virtual" corporations, companies, factories, and offices is receiving increased attention in academic and business circles.[13] A virtual organization is one that is based on recent technological innovations, namely, telecommunications and computing and relate to a view or philosophy of how organizations are constructed or patterned. Borrowing heavily from the Network and Matrix organization concepts, the Virtual organization concept also uses a "dynamic network" consisting of a "controlled

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[12]Ibid, 67

[13]Christopher Barnatt, "Office Space, Cyberspace and Virtual Organization." *Journal of General Management*, Vol. 20, (Summer 1995), no. 4), 78.

interlinkage" of members and hence, their operations and activities.[14]

The concept of "Cyberspace" -- the emerging global telecommunications-computing medium in society (e.g., various types of hardware and software, electronic mail, electronic bulletin boards) -- is crucial to understanding virtual organizational structures and designs.

The concept centers on the use of these automated tools and other advanced techniques such as video-teleconferencing to achieve "complex and interactive methods of remote employee working" (also called "telemuting"). Stated another way, virtual organizations create electronic networks and links (i.e., "virtual webs") within and across organizational sussystems -- internally and externally.

Variants of the virtual organization, in addition to telemuting, include development of "hot desk" environments (shared arrangement); adoption of "hotelling," and the operation of "virtual teams" enabled via groupware.

Telemuting or "homeworking" is a ten-year old concept that is continuing to spread around the world (more than six million Americans now have formal homeworking arrangement). It means an employee uses a remote terminal to access his or her office system and hence, is part of a virtual organization.

By far, however, Virtual Reality is the most advanced concept or design in the virtual organization realm.[15] In the most imaginative virtual setting -- "virtumuting" -- virtual working environments are created using computer graphics.

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[14]Hellriegel, 596.

[15]Virtual reality uses IT and computers and is created by a display and control technology that surrounds the user with an artificial environment that mimics real life. The user of virtual reality does not passively view a computer screen but rather becomes a participant in a three-dimensional setting (Hellriegel, 1995:655).

These types of organizations by their very design are decentralized and can either be autonomous -- i.e., they can be pursued independently from other innovations or they can be fundamentally systemic -- i.e., their benefits can be realized only in conjunction with related, complementary innovations.[16]

An example of virtual reality technology applied to a large organization with Boeing Aircraft Corporation's CATIA three-dimensional computer-aided design modeling system, used throughout the entire new 777 transport design-to-build acquisition process (discussed in Appendix A).

In sum, the virtual corporation increasingly is being viewed by corporate, government, and other business leaders as a highly innovative organizational design to respond to the chaotic, unpredictable global environment of the 1990s and beyond.

Fishnet Model

This type of informal organizational concept is similar to the network model and not surprisingly, is based on the metaphor of a "fishnet." This organization, it is asserted, emerged from the "chaos" of the monolithic, hierarchical, industrial-era organizations that formerly dominated the corporate and governmental organizations.[17]

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[16]It is important to note that in the latter, potentially sizeable management challenges could result in *acquisition* and *exchange* of information by different elements; further, this information must be shared and its coordination adjusted throughout an entire product system (Cheesbrough, 1996:67)

[17]Robert Johansen and Rob Swigart, Upsizing the Individual in the Downsized Organization: Managing in the Wake of Reengineering, Globalization, and Overwhelming Technological Change, (Reading: Addison-Wesley, c1994), 15-20.

The fishnet organization, in contrast, is flexible; it can form and re-form varied patterns of connection. The middle manager may at one time be at the "apex," at another in the middle.

The main attribute of the fishnet organization appears to be high flexibility and adaptiveness to changes in the environment. The fishnet concept is explained as follows:

> Imagine a net laid out on a dock. If you grab a node and lift it, the rest of the net lattices nicely under it. A temporary hierarchy appears as long as you hold up the node, with layers consistent with how high you lift the node and the width of the mesh. The hierarchy disappears when you lay down the net. Pick up another node, another soft hierarchy appears.[18]

This type of organization then, is based on horizontal and cross-functional, as opposed to vertical, hierarchical structures. Teams are central to the fishnet concept of a "high-performing" organization; the "adhocracy" style extensively is used. Individuals are "forged into small, ad hoc, cross-organizational, time-focused, task-driven work groups." Their trademark is "action and bureaucratic bypass."

Fishnet organizations do not mean hierarchies disappear; the former "arise to meet immediate demands" in the new competitive environment and "float" on hierarchies. These type of organizations rely on all types of teams and Information Technology, which includes a combination of telecommunications and computing; this is as the

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[18]Ibib, 16.

"cord" out of which the fishnet is woven and indeed, the "electronic net" for connectivity and integration among organizational elements.

One prominent corporate example of a fishnet organization given is Asea Brown Boveri, an electrical systems and equipment manufacturer employing more than 240,000 people worldwide, and having revenues of more than $25 billion.[19]

In sum, the main advantage of the fishnet organization appears to be its ability to rearrange itself rapidly to flexibly -- and rapidly respond to uncertainty in the environment, while retaining its inherent strength. The next portion of the paper discusses the characteristics and interrelationships of the job design and process subsystems of the organization, as these are essential to support new organizational designs.

Job Design, Processes, and Redesign/Reengineering

Job design is the "specification of tasks that are to be performed by employees, including expected interpersonal and task relationships. Further, job design occurs every time individuals are assigned work, given instructions, or empowered to perform tasks and pursue goals.[20]

Job design also is one of the corner stones of organizational reengineering efforts. The connection lies in reengineering's focus on the design or redesign of the collection

[19]ABB's CEO states this allows it to simultaneously be "global and local, big and small, and radically decentralized with centralized [planning,] reporting, and control." ABB is composed of small, regional work units like independent businesses, led by a strong central executive committee that overseas and tracks performance and makes quick decisions when needed (Ibid, 17)

[20]Hellriegel, 529.

of tasks that create value -- the processes. Examples include product development, customer service, and order fulfillment. Reengineering an organization's processes is aimed at the three "Rs" -- rethink, redesign, and retool.[21]

Job Engineering

Job engineering must logically occur before reengineering; it is focused on the tasks to be performed, the methods to be used, work flow between employees, layout of the workplace, performance standards, and interdependencies between people and machines.[22]

Finally, five areas related to productivity, effectiveness, and motivation, must be addressed in the job engineering approach: job specialization, task simplification, job simplification, repetition, and automation.

Job Redesign

Reengineering is focused mainly on the design portion or subsystem of the organization. Other forms of job design or redesign besides reengineering include (1) quality circles, Total Quality Management, reinvention, and process management.

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[21]Michael Hammer and James Champy, Reengineering the Corporation: A Manifesto for Business Revolution, (New York: HarperCollins, 1994), 28

[22]Hellriegel, 533.

Reengineering is a popular type of job redesign It also is called Business Process Reengineering (BPR) and might involve the combining of several jobs into one and emphasize end-to-end process integration.

Several other principles of BPR are cited: workers make decisions (they are part of the work and are empowered); processes have multiple versions (signaling the demise of a single set of standards/directives); and work is performed where it makes the most sense (relocate if necessary, across organizational boundaries).[23]

Additional principles espoused are checks and controls are reduced (deemphasized, deferred -- not ignored); "reconciliation" is minimized (automated, reduced external contact and coordination on a contract); a "case manager" provides the single point of contact ("empowered customer representatives"); and lastly, a combination of hybrid, centralized, and decentralized operations prevail (flexible designs with economies of scale).[24]

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[23] Hammer and Champy, 53

[24]Martinez, Erwin V, "Successful Reengineering Demands IS/Business Partnerships" *Sloan Management Review*. Vol. 36, (Summer 1995), no. 4, 52.

The tenets of reengineering are summarized in **Figure 3:**

The Nature of Reengineering

Jobs change from single to multi-dimensional work; people's roles change from controlled to empowered; job preparation changes from controlled to empowered; focus of management continues on performance measurement and compensation but shifts from the activity to the result (similar to Osborne & Gaebler's reinvention concept); advancement criteria changes from performance to abilities (core competencies); values change from protection (i.e., of position, turf, power) to production; managers shift from being supervisors to being facilitators and coaches; organizational structures change from hierarchical to flattened; executives change from scorekeepers to leaders.

Figure 3. Nature of Reengineering Work, Hammer & Champy, 1993:65

Reengineering Work

Reengineering advocates moving away from traditional vertical organizations and structures to cross-functional or horizontally-integrated ones. Reengineering, states its inventors, is a new way to "use the power of modern IT to radically redesign our business processes in order to achieve dramatic improvements in their performance."[25]

This fundamental "rethinking" of the way work is done and the methods to deliver outputs are critical to understanding reengineering. Porponents argue it attempts to respond rapidly to the coming trend in management of decentralizing, and eventually, dramatically can alter an organization's structures and management practices. This is exemplified by the axiom: "don't automate, obliterate." Reengineering causes "work units" to result from previous "functional departments and productionteams."[26]

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[25]Michael Hammer and James Champy, Reengineering the Corporation: A Manifesto for Business Revolution, (New York: HarperCollins, 1994), 28.

[26]Hammer & Champy, 65

Figure 4 illustrates the dimensionality of organizational change extended to the reinvention and reengineering methods and shows the phases of change approaches and methods. Notably, these include Process Improvement and Reengineering.

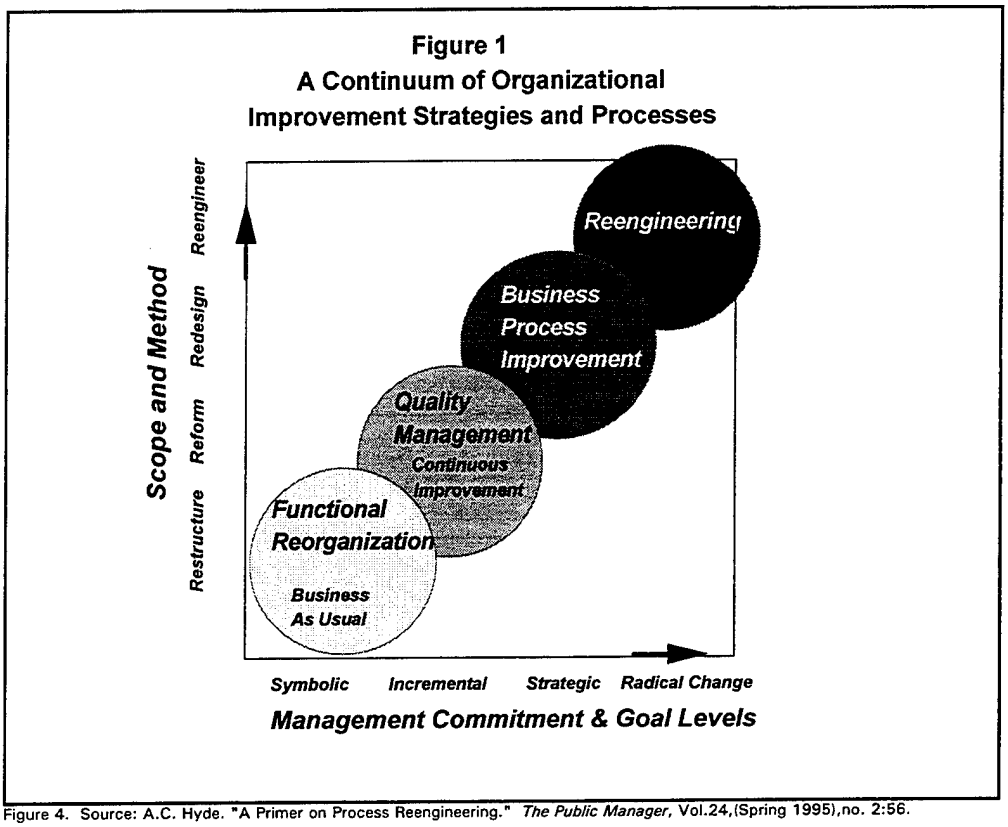


Figure 4. Source: A.C. Hyde. "A Primer on Process Reengineering." *The Public Manager*, Vol.24,(Spring 1995),no. 2:56.

Summary - Organizational Designs

The objective of this paper has been to examine the characteristics and performance criteria of innovative organizational designs and job designs, given the challenges of the new global, competitive environment affecting both public and private organizations.

An understanding of these new structures and processes can broaden perspectives on organizational planning and also contribute to leaders, managers, and researchers

understanding of how organizations can better adapt to, and function in, the new, chaotic, global environment of the future.

The principal catalysts for change and reengineering are (a) inefficiency of outdated job designs, work flows control mechanisms, and organizational structures that "came of age in a different environment" (i.e., the 'smokestack' or industrial age), and (b) the 'coming of the new organization,' which will bring with it an ability to keep pace with "changes in technology, demographics, and business objectives."[27]

Next, the innovative organizational and job designs examined in this paper reflect the trend toward a "contingency" approach to strategic change and are aimed at providing a flexible, responsive, and adaptive capability for governments and businesses of all types to meet the challenges of the 21st century and beyond.[28]

Organizational changes have been attributed to advances in high technology, e.g., telecommunications and computing; innovative management practices like delayering and streamlining; and also changing values and cultural attitudes. Managerial changes are also accompanying these organizational changes, notably in the decentralization of authority and more empowerment of individuals.

The major finding from this research is organizations of the future will be a significantly altered ones in which power and authority are decentralized; empowerment of individuals will take place at all levels, through collaborative, teamwork approaches; and ultimately, a transformation into the modern "learning

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[27]Hammer & Hyde, 1995 & Drucker,1988:46.

[28]Bennis (1967, in Shafritz & Hyde, 1995,284) stated these fundamentally new organizations of the future (i.e., new social systems") and the "rapid and unexpected" changes that soon will begin to reshape traditional bureaucracies.

organization."[29]

The philosophy of new organizational designs should be first, to permit attainment of the organization's end objectives in strategic change; to stabilize and institutionalize the changes in the organization, and to ensure continuity, adaptation, and innovation; second, these designs should allow the organization to function efficiently, effectively, and profitably in the global, turbulent environment.[30]

Appendices A and B analyze the Boeing Aircraft Corporation's reengineering approach applied to the new 777 commercial airliner and the Department of Defense' reinvention initiative, the Defense Performance Review (relative to acquisition reform), respectively.

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[29]Drucker, 1980, Bennis, 1967, and Peter M. Senge, The Fifth Discipline: the Art & Practice of the Learning Organization. (New York: Currency Doubleday, 1994).

[30]French & Bell, 1995.

In conclusion, the philosophy and accompanying attributes of these innovative organizational and job designs are summarized in **Figure 5**:

Key Design Attributes of Innovative Organizational Designs
1. Choosing the right design: idealized? decentralized? flattened hierarchy?
2. Deliberative, participative planning through implementation
3. Centralized planning but decentralized execution and accountability
4. Shared responsibility and authority among all members
5. Systemic, continuous innovation -- all subsystems involved
6. Flexible, "porous," adaptive, responsive, "fleet-of-foot" designs
7. Self-directed, self-managed, autonomous work teams
8. Creative, innovative, entrepreneurial, empowered teams and members
9. Knowledge-sharing, continuous, "generative," "appreciative" learning
10. Focused, high-performance/high commitment; thinking "outside the box"
11. Continuous communications with front-line people "communicating up"
12. Crossing functional boundaries; "boundarylessness;" "stretch"
13. High congruence with tasks/processes (balanced differentiation and integration)
14. Resist stagnation and decline rather than change, challenge, growth and opportunity
15. Thoughtful, measured, and controlled application of IT and computers
16. Design and redesign of work processes but more on a "project" basis -"complete processes or businesses that serve a specific category of customer").

Figure 5: Key Design Attributes of Innovative Organizational Designs

Appendix A
Case Study No. 1 - Reengineering Illustration: Analysis of a High-Performance, High Commitment U.S. Corporation

The Boeing Aircraft Corporation design, manufacture and delivery of the new 777 super commercial aircraft provides a highly useful illustration of the successful application of reinventioin and business process reengineering practices but more so, the conduct of a major transformational, system-wide change in a top Fortune 500 company.

The history behind both the challenges and the strategic changes occurring at Boeing can be traced to the earlier problems discussed regarding bureaucratic organizations (structure, staffing, differentiation, etc.)

In Boeing's case, old manufacturing design processes -- notably, the sequential growth of numerous "specialties" -- "seal off one process or work unit from another and create rivalries and misunderstandings." Similar to what has occurred in the government, "a whole new lexicon of technical jargon also emerges, creating barriers to progress and inefficiencies in production."

Central to Boeing's radical change strategy was a "back to the basics" approach integrating people, process, technology and values. Boeing is attempting to recapture team spirit to dramatically increase their competitive advantage in the airline industry; this is chiefly embodied in their "working together" concept (Condit, 1992:4).

The "team" approach began with initial planning for the 777 when people from areas such as engineering, finance, and manufacturing were brought together to map out the production strategy. Innovative "design-build" teams were used from the onset in the design process -- cross-functional in nature (e.g., finance, operations, engineering design, and support).

The Boeing team concept means that the team evaluates the total aircraft design from numerous perspectives, resulting in more efficient, cost-effective production. In parallel, "superordinate" quality and reliability controls were prominent throughout all phases in the process.

Suppliers were also part of the "working together" concept -- essentially "co-designers." This resulted in greater integration, ease of services and maintenance. Three types of team meetings were employed: regular manager meetings, leadership meetings, and "all-team" (i.e., cross-functional) team meetings.

This approach recognizes the importance of people despite the sophisticated technology tools and high degree of automation (Condit, 1992:7). Boeing states team-building is "difficult to do," but when it works, marked improvements occur in idea-sharing and communications, again, the key to attaining greater efficiency and effectiveness in organization-wide activities.

Boeing's CEO recently stated the former bureaucratic model has led to an ingrained, individualistic mentality prevalent in U.S. industry today. This corporate philosophy states the "outmoded belief" being challenged today is that sharing one's ideas with others or helping others to enhance their performance is contrary to one's self-interest...to preservation of one's power, prestige, and position.

This philosophy reflects the belief that one advances one's career at another's expense; this no longer is viewed as the most useful attitude from the workplace to possess. To create high-performance teams, "you need employees who can work together in a way that promotes learning and the flow of ideas and information."

Boeing's "virtual reality" CATIA three-dimensional computer-aided design (i.e., a new computer-based technology modeling system with digital accuracy), pervaded the entire new 777 transport production process.

In summary, the Boeing 777 is the world's largest commercial airliner designed in a "paperless" environment combined with over 200 cross-functional "design-build" teams. The application of advanced IT and computing in this comprehensive manner by Boeing was a first; notably, it meant that producibility factors were incorporated as the aircraft design matured, rather than after it was released, when manufacturing changes become costly.[31]

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[31] Richard G. O'Lone, "777 Revolutionizes Boeing Aircraft Development Process," *Aviation Week & Space Technology*, (3 June 1991), 35-36; "Final Assembly of 777 Nears," Ibid, (12 October 1992), 48-51; Paul Proctor, " Boeing Rolls Out 777 to Tentative Market," *Aviation Week & Space Technology*, (11 April 1994), 36-40, and Condit, Philip M. "Working Together: the 777 Story." 81st Wilbur and Orville Wright Lecture to Royal Aeornautical Society, London, UK, 17 December 1992.

Appendix B
Case Study No. 2: Department of Defense Acquisition Reform

Defense Performance Review

The Defense Performance Review (DPR) initiative is the Department of Defense (DoD) response to the NPR; it formalizes DoD reinvention-related activities that have occurred since the end of the Cold War in 1991, and according to senior defense officials, responds vigorously to the steady decline in resources for national defense.[32]

The DPR's main acquisition reform objective is "to devise innovative ways to encourage more business-like practices and market-driven efficiencies throughout the department."[33]

Several initiatives have been completed or are in progress, including: a restructuring of the Office of the Secretary of Defense (OSD); the "Bottom-Up Review" of military requirements, programs, future force structure, and, notable here, reengineering acquisition. The first stage of DoD acquisition reform is aimed at defining a streamlined, sensible, and coherent set of acquisition laws and regulations.

Problems Leading to Reform

As far back 1986, President Reagan's Packard Commission stated the problem in DoD acquisition was apparent: many of the U.S. armed forces weapon systems cost too much, take took long to develop, and by the time they were fielded, incorporate obsolete technology."[34]

The Packard Commission recommended several steps, including "greater use of [commercial] off-the-shelf components, systems, and services," "high priority to building and testing prototype systems before moving to full-scale development", and "use of these prototypes in early operational testing, which begins in the advanced development stage and goes on through full-scale development."[35]

A long history of problems exists in this area. Several examples of problems encountered in the acquisition of commercial high-technology are contained in the DPR

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[32]Vice President Al Gore, From Red Tape to Results: Creating a Government That Works Better and Cost Less, Department of Defense Accompanying Report of the National Performance Review [Defense Performance Review], (Washington, DC: U.S. Superintendent of Documents, September 1993).

[33]Defense Performance review (DPR), 5

[34]Ibid,21

[35]Larry Lynn, "Advanced Concept Technology Demonstrations: Today's Technology for the Warfighter," *Army RD&A,* [Department of the Army Professional Publication of the Research, Development and Acquisition Community], (September-October 1995), 4-6.

Report.[36] DoD became aware of a large telecommunications company's development of a narrowband voice radio, featuring improved voice, quality, and enhanced encryption capabilities.

These were in demand by not only DoD but many law enforcement agencies. Unfortunately, current procurement laws and regulations prohibited DoD from acquiring them, even through they were fully available to the public. The result was that the government was forced to buy a less advanced, "old technology" system, while the commercial customers bought the state-of-the-art system.

A similar situation occurred during Operation Desert Storm, when the U.S. Air Force urgently attempted to acquire commercial radios (manufactured by Motorola) to upgrade the tactical communications capability of its front-line units.

The Service ran into a veritable "roadblock" with existing procurement rules, specifically, the "commercial unit lacked the record-keeping systems required to show the Pentagon it was getting the lowest available price." The solution was the Japanese, non-military members of the U.S.-led coalition against Iraq, circumvented the problem by purchasing the radios and donating them to the Air Force.[37]

Figure 4 summarizes the DPR's main areas of focus and key reinvention initiatives. A representative set of these initiatives (marked by an asterisk) will be examined next, followed by a brief overview of three DPR congressionally-mandated projects.

Figure 6. DPR Major Reinvention Areas

DPR Major Reinvention Areas	
1. Simplified Acquisition Thresholds	7. Contract Formation
2. Commercial Items*	8. Major Systems and Testing Statutes
3. Military Specifications and Standards	9. Contract Administration
4. Standards of Conduct	10. Service-Specific Acquisition Laws
5. Defense Acquisition Pilot Program*	11. Intellectual Property Rights
6. Unified DoD Budgeting	12. Defense Trade and Cooperation

Source: DPR Report, 1993: 19-46

The Path Toward Improvement

Federal Acquisition Reform Act

The unprecedented efforts of the DoD Acquisition Law Advisory Committee, culminated when its "Section 800 Report" was submitted to Congress in January 1993. This wassignificant achievement for the Clinton Administration, as it resulted in the signing into law of virtually all provisions requested by DoD in the government-wide Federal Acquisition Streamlining Act (FASA, 13 October 1994).

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[36]DPR, 23

[37]Ibid, 24.

FASA provided DoD for the first time, the ability to change the way it does its business; it would be allowed to adopt "smart, business-like" practices and "outsource" (i.e., contract out to another company, usually in the U.S.) when it makes operational and economic sense."[38]

Several initiatives are underway in DoD again, to enact FASA measures. Focus will be on two of the more significant of these (denoted in Figure 1with an asterisk) for the remainder of this section of this paper.

The DPR objective in the commercial area is to "maintain DoD's technological superiority by ensuring it has access to "state-of-the-art" commercial technology and to integrate the defense and commercial industrial base by allowing DoD to acquire commercial products using standard commercial practices.

DoD's solution to this long-standing problem is to fundamentally reengineer the acquisition policies and process; in effect, a enact a top-down transformation and adopt "innovative, business-like practices."[39]

In the short-term, FASA will go a long way to achieving many of the needed reform goals, notably in streamlining rules and regulations, thereby allowing DoD to take full advantage of advances and purchase these "off-the-shelf", state-of-the-art commercial products and other technology.

So, in a major breakthrough for DoD, FASA overhauled many existing regulations, waiving many unnecessary requirements affecting DoD (and other federal agencies), thereby allowing dramatically expanded procurement of commercial items.

This authority spans items available through recent advances in technology or markedly improved performance, and importantly, that are expected to be "available in time to meet the government's solicitation and delivery requirements." Included are most types of items offered and sold in the commercial marketplace such as installation, maintenance, repair, and training services).

In parallel, for the mid- and long-term, DoD is pursuing several innovative management reforms (e.g., TQM and other competitive market-oriented practices); again, these are modeled after the private sector.

In sum, these reforms focus on establishing a strategic planning effort and a top-down/bottom-up "task force" approach, comprised of both senior-level policy making and 'specialists' assigned to worker-level "process actions teams" (PATs) and integrated product teams (analyzed next).

Finally, when other reforms like simplified acquisition thresholds are added, coupled with a deemphasis on military specifications and standards, significant streamlining will occur in DoD research and development.

These reforms in turn, are expected to have major impacts e.g., greater cost-effectiveness, shortened lead times for development of systems) on the Services' procurement, testing, and fielding of major weapons, command, control, communications,

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[38]Public Law 103-355 [S.1587]; Federal Acquisition Streamlining Act Of 1994. Oct. 13, 1994.

[39]DPR, 20.

and intelligence systems. The next section will examine the more significant overarching initiatives being pursued in DoD's "Pilot Acquisition Program."

(2) DoD Pilot Acquisition Program

In concert with the move away from a "regulation-based system to a market-based, entrepreneurial system," DoD has established several pilot programs to demonstrate the advantages inherent in removing barriers to the use of commercial practices and products.

These efforts align with the President's domestic priorities and are intended to reinvigorate and preserve the "national industrial base and stabilize domestic employment opportunities."[40]

The "Defense Acquisition Pilot Program" was approved by FASA and is aimed at testing whether or not efficiencies could be achieved from using standard, commercial industrial practices to procure defense goods and services.

Seven candidate programs, identified by DoD's Section 800 Panel, were approved by FASA and are in progress. These include Fire Support Combined Arms Tactical Trainer; Joint Direct Attack Munition, Commercial Derivative Engine; and Global Grid (a revolutionary, world-wide fully automated, telecommunications/computing initiative to support the U.S. armed forces at all levels).

Three steps have been taken to effectively plan for the pilot programs: (a) development of a package of statutory waivers to apply to the pilot programs; (b) development of a regulatory waiver package to complement the statutory ones -- intended to "remove the barriers to commercial item acquisition that are imposed by DoD;" and (c) development of an "implementation strategy for each pilot program that will govern how the program will operate and be overseen in the streamlined commercial environment."[41]

The discussion of the pilot acquisition program will conclude with a brief overview of DoD, Department of the Army, and Department of the Navy acquisition management and system development practices based on successes in the private sector.

These initiatives are highly representative of and patterned after successful ones in the private sector and thus, provide excellent insights into DoD reinvention and reengineering acquisition reforms. They are: Integrated Product Teams (IPTs); Advanced Concept Technology Demonstrations (ACTDs); U.S. "Army Virtual Acquisition;" and the U.S. Navy "Surface Combatant 21."

(3) Integrated Product Teams

IPTs are a major management/organizational process initiative in the Office of Deputy Under Secretary of Defense for Acquisition.[42] Employing a combination of BPR

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[40]DPR, 25.

[41]Ibid, 26.

[42]Lynn, 4.

and TQM/process improvement techniques, the objective of IPTs is to create horizontal, cross-functional teams of specialists in acquisition who would be involved in all phases of the acquisition process.

This represents a significant cultural change and a radical departure from the past; indeed, IPTs are a clear break away from traditional large, vertical, and centralized control of the multi-phase DoD acquisition process.

Under the old system, oversight and review of DoD programs often was inconsistent and done mainly after reaching critical milestone decisions.

Frequently, this was too late to resolve many pressing technical, programmatic and operational issues, causing development costs to rise sharply, and many programs to become needlessly "stretched out" and delayed.

The IPT concept would attempt to streamline and accelerate the DoD acquisition process first, through a number of the reform measures analyzed above (e.g., FASA, commercialization, IT).

In addition, specialists would be empowered to speak for their superiors regarding critical decisions and engage in full and open (i.e., no "secrets") discussions at all phases in the acquisition process.

IPTs would place emphasis on *preventive* rather than *corrective* measures and *continuous insight* (versus *sporadic oversight*). Individuals member of IPTs would come from multi-discipline organizations such as logistics, information systems, systems engineering, etc., and from different organizational levels (e.g., Services, OSD, JCS).

IPTs also would be formed at both the senior acquisition executive and working levels to ensure top-down, bottom-up coordination and exploitation of all available talent.

The IPTs -- and the numerous acquisition reforms in general -- amounts to a major paradigm shift for DoD from an environment of overregulation, strict enforcement and primary focus on functional area performance to one characterized by end-to-end integration, "incentivized performance," and program success.

The ultimate intent of IPTs then, is to create a "win-win" situation for system developers, program managers and their principal customer -- the joint warfighter. Advanced Concept Technology Demonstrations (ACTDs) are examined next.

(3) DoD Advanced Concept Technology Demonstrations

ACTDs are new programs (also under the auspices of OSD) to "help revolutionize" the DoD acquisition process to adapt to today's changed economic and global threat environment. Specifically, ACTDs were designed to transfer mature technologies rapidly from developers to users, i.e., "warfighters."

More important, ACTDs function as integration efforts to "assemble and demonstrate a significant new military capability," based on "maturing advanced technologies." This is done in a "real-time operation" and on a scale sufficient to validate operational utility and systems integration.

Lastly, the customer -- in this case, the warfighter -- is involved in all phases of

technology development and system acquisition processes.[43]

The objective of ACTDs is to be anticipatory of future combat needs and allow the customer (user) to acquire a more complete understanding of new technologies in their early stages.

This should enable the military to develop and refine doctrine, tactics, operations, techniques, and procedures to fully exploit the new technology, and thus, increase potential for support to military operations during crisis, contingency and war time situations.

ACTDs then, should address major warfighters' needs and provide significantly increased military capabilities. In addition, ACTDs should offer sufficiently mature technologies, be low in risk, and affordable, should the government decide to develop and acquire an "objective" system.

(4) U.S. Army "Virtual Acquisition:"

Working closely with OSD and the other Services, the U.S. Army is actively engaged in reinventing and reengineering their acquisition process.[44] This new process, consistent with OSD guidance and direction, attempts to infuse "radical" changes in the way the Army develops, fields, and supports weapon systems for its soldiers.

First, significant changes are being made in federal law, policy, and process as noted above. The goal of one major initiative in Army acquisition reform is "virtual" prototyping; to "put into place the latest technology while simultaneously driving down the cost of acquisition."[45]

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[43]Ibid, 5.

[44]Abbott, Col. Danny L. and Mario W. Lucchese. "Acquisition Reform: Two Years of Change." *Army RD&A,* [Department of the Army Professional Publication of the Research, Development and Acquisition Community]. (September-October 1995), 30-33.

[45]Ibid, Dr. Kenneth J. Oscar, "Affordable Acquisition," 17-20.

The Army has established a "roadmap" (shown in **Figure 7**) for the future with guiding principles.

Figure 7: U.S. Army Acquisition Improvement Principles

U.S. Army Acquisition Improvement Principles	
1. Commit to Quality	9. Integrate Testing and Evaluation
2. Stress Acquisition Strategy	10. Aggregate Contracts
3. Accelerate Technological Advances	11. Use Electronic Media
4. Team the Work Force	12. Reduce Cycle Times
5. Reduce Functional Requirements	13. Use Foreign Sources and Markets
6. Leverage Commercial Sources	14. Reduce O&S Costs
7. Expand Best Value Contracting	15. Operate Multi-Disciplined Teams
8. Shape the Industrial Base	16. Measure Performance/Compliance

Source: U.S. Army RD&A Publication, Sep-Oct 95: 31

The most innovative feature of the Army investment strategy area is the planned use of sophisticated modeling and simulation technology -- employing virtual reality -- throughout all stages of the acquisition process. Of note, the Army's initiatives in this area are fully integrated with OSD's IPT process and its ACTD program approach.

The Combat Performance modeling portion of this effort is intended to duplicate battle conditions (e.g., Desert Storm) and employ "virtual reality" in prototyping of weapons systems. Three types of simulations exist:[46]

First, Constructive Simulation consists of wargames and models, many of which rely heavily on algorithmic and mathematical models. These simulations have been used extensively and are the mainstay of the combat development process.

Second, Virtual Simulation focuses largely on manned simulators and distributive interaction within a synthetic environment, in many cases other simulators. Virtual simulators now in use provide low-cost methods of experimenting with new technologies and prototypes.

Third and last, Live Simulation is when actual soldiers and equipment operating together, often on instrumented ranges. This effort will ensure "lock-in" on the correct design the first time and avoid the former time-consuming and costly development approach.

Next , "virtual" testing can be used to simulate military scenarios, terrain, weather, and other environmental conditions.

Finally, "virtual" design and manufacturing -- again, pioneered in private industry by corporations such as Boeing (Appendix A, Case Study No. 1) -- and also can be used to accurately model planned production facilities and processes, thereby helping to lower manufacturing and production costs.

[46]Department of the Army, U.S. Army Battle Labs: Force XXI, (1995),10.

In sum, the lessons learned thus far with DoD's DPR reinvention and reengineering initiatives are many; most important, is the need to transform organizations, practices, procedures, and cultures and develop the "ability to keep up with technology and transition it our forces quickly, efficiently and at a price we can afford."[47]

Figure 8 shows the similarities between the new Boeing's new 777 commercial airliner and the U.S. Army's Commanche/RAH-66 program. The 777 acquisition process was leveraged extensively by the Army in its new helicopter development and is a visible, real-world application of reinvention and reengineering change approaches and techniques.

These similarities specifically are in the area of increased industry-government interaction (i.e., commercial-military). This has resulted in shortened development cycles, greater systems and functional integration, and reduced acquisition costs.

Figure 8: Acquisition Similarities Between U.S. Army RAH-66/Commanche Helicopter & Boeing 777

Similarities Between RAH-66 Commanche & 777	
RAH-66 Commanche	Boeing 777
1. Requirements Solidified & Customer in "Loop"/Actively Involved	1. Same; Customer = Airline Representatives.
2. Concurrent Product Development Teams (i.e., IPTs)	2. Same – called Design-to-Build Teams
3. CATIA- 3-D Electronic Design Model	3. CATIA- 3-D Electronic Design Model
4. Integrated Government/Commercial Software	4. Similar
5. External tests of Systems in Integration Labs with Hardware in Loop Prior to Flight	5. Same
6. Integrated, Open, Distributed Architecture	6. Distributed Architecture
7. Display, Processing, Communications, Navigation, Diagnostics, and Custom Metrics	7. Same with Commercial Applications
8. Structural Material Usage	8. Same Types, Different Combinations

Source: Boeing-Sikorsky Briefing to U.S. Army War College, 15 April 1996

(5) Other Notable Service Reinvention/Reengineering Efforts

The U.S. Navy's new surface combatant for the 21st century and it radical "arsenal' ship -- under the aegis of the new "SC-21" program -- are in the concepts/design stage of development and strongly emphasize reengineering and reinvention principles.

The arsenal ship, in particular, is innovative in that it is aimed at long range mass strike against land targets during major regional conflicts from the sea -- and therefore could offer improved flexibility, responsiveness, and warfighting capability for the

[47]Lynn, 5.

military commander.[48]

The arsenal ship will use a "skunkworks" organizational approach[49] and rely heavily on commercial off-the-shelf materials; streamlined acquisition processes and paper-work (i.e., all electronic) and like Boeing, design-to-build teams; and a "revolutionary process" known as "horizontal systems engineering" or "total systems engineering." TSE regards the ship as a "system-of-systems" and provides "built-in flexibility needed for insertion of future technologies.

This new approach reflects a fundamental paradigmatic shift in design thinking in that past Navy ships -- while the "best warfighting system in the world" -- were built in "stove-pipe" fashion and are cost-ineffective in today's new environment.

By integrating these (common) functions and capabilities through horizontal engineering, the Navy believes they will be provided significant opportunities never before possible because of the stove-pipe way we've done business in the past.

This new way of business then, will integrate common functions and capabilities throughout the design-to-build process, which will result in several advantages (1) multi-functional/mission systems, (2) reduced costs, logistics, and maintenance, (3) and lower life-cycle costs.

Finally, Navy scientists and engineers also extensively will use computer modeling and simulation (i.e., "notional virtual ship" initiative) which will focus on early insights into design and performance issues, and eventually lead to "virtual" operational test and evaluation and training environments -- an "attractive alterative to reduce costs and time to field."[50]

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[48]Lt. Jon P. Walman, *Surface Warfare*, (November-December 1995),2.

[49]"Skunk works essentially are small teams of engineers, technicians, designers, and model makers that were placed together with no intervening organizational or physical barriers to develop a new product from idea to commercial prototype stages (Peters & Waterman, 1982:8). The Nation's first supersonic, high-altitude reconnaissance aircraft i.e., the U-2 and SR-71 Blackbird resulted from this innovative approach.

[50]Ibid, 4.

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